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FINAL REPORT

SCREENING OF EMS TREATED FLAXSEED FOR ELEVATED LEVELS OF SDG

19970046

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SCREENING OF EMS TREATED FLAXSEED FOR ELEVATED LEVELS OF SDG

ADF Project: 9700046

Principal Investigator: Dr. Alister Muir
Collaborators: Dr. Ron Willen and Dr. N.D. Westcott

Final Report

November 1, 1999

Abstract

EMS treated flax seed lines generated by the Crop Development Centre, University of Saskatchewan, were increased in the field during the 1997 and 1998 growing seasons. Of the approximately 4000 lines available seed was obtained from 3210 lines. The remaining lines either failed to set seed or produced insufficient seed for lignan analysis. A total of 52 lines were identified as having lignan levels 2 Standard Deviations (SD) greater than the mean and an additional 72 lines were 2SD below the mean. Both the high- and low-lignan lines will be used in future studies of the inheritance of the lignan trait, while the 52 high-lignan lines will be evaluated for inclusion in future breeding programs

Executive Summary

Before analysis of samples could begin, the HPLC equipment owned by the Crop Development Centre (CDC) was transferred on loan to Agriculture and Agri-Food Canada (AAFC). This equipment, which had not been used for a number of years was restored to operational condition. The pumps and the autosampler were refurbished and upgraded to current operational standards compatible with the current version of Millennium chromatography manager by AAFC staff, while the detector, which required factory serving was completely rebuilt by the manufacturer. The system was set up in the HPLC lab of the Crop Utilization Section of AAFC and used for the lignan analysis.

The first half of the seed increase of the EMS treated flaxseed germplasm collection was successfully completed by the CDC during the summer of 1997. Seed was obtained from 1460 M3 lines for lignan analysis. The second half of the EMS treated flaxseed germplasm

(approximately 2000 lines) was increased in 1998. Seed was obtained from 1750 M3 lines for lignan analysis. Check samples were also included in each block of lignan analyses to assess the reproducibility of the analyses. There was a seasonal difference in mean SDG levels between the two years, so the samples from each year were treated separately. A total of 52 lines were identfied as having SDG levels that were 2SD greater than the mean and 72 low lignan lines were identified.

The high and low lines from each of the two years will be carried forward into the next phase of germplasm evaluation which will include determination of the heritability and stability of the high SDG trait. High-lignan lines will also be evaluated for inclusion in future breeding programs to generate new high-lignan flax cultivars.

Technical Report

A total of 3210 EMS treated seed lines were analyzed for SDG content (Table 1).

Table 1. SDG content (mg/g seed) of EMS treated flaxseed lines increased in the field at Saskatoon during the 1997 and 1998 growing seasons.

Year	Number	Mean	SD
1997	1460	10.66	1.14
1998	1750	10.21	2.09
Total	3210		

Of the 1460 samples from the 1997 field increase, 24 were less than and 18 greater than 2 SD from the mean. In 1998, 48 of the lines were less than and 34 greater that 2 SD from the mean. The 52 high SDG lines will be the subject of further detailed evaluation to verify that these levels are stable. Based on these further assessments, lines will be selected for inclusion in heritability studies and subsequently into breeding programs to increase the level of SDG in the next generation of flax cultivars.

Although several of the seed lines had very low SDG levels, none were found to have no SDG. EMS mutagenesis would be expected to create SDG deficient mutants, however the probability that these mutants would be viable is quite low, since the SDG complex is thought to be a component of the seed coat. It is therefore it is not that surprising no SDG deficient mutants were observed. Some of these low SDG lines will however be useful as parents in heritability studies.

The highest level observed (17 mg/g seed) was approximately the same level previously observed in a single sample of Linola 947.

Personnel

A EG-2 technician (Tracey Alger) was hired and reported to work February 4th. She will work full time on the project for a period of six months at an Annual salary rate of $31,019.00. Tracey was employed to work on other projects in the centre during the late summer and early fall. Tracey was redeployed back to this project in November of 1998 to analyse the 1998 samples. In April, Tracey went on Maternity leave and Kendray Reschny was hired to fill the maternity leave term.

Equipment

No new equipment has been purchased to date. Repairs and upgrades to the CDC Waters HPLC system have been completed. The Detector upgrade was significantly more expensive than originally projected. The entire optics bench had to be replaced as the original optics bench was not repairable.

Project Developed Materials

A list of the high and low lignan lines is attached.

Project Photos

n/a

Acknowledgement

We propose to present a summary of this research to Flax Growers Western Canada annual meeting in 2000.

Expense Statement

See attached

Alister Muir
Natural Products Chemist
Crop Utilization Section
Agriculture and Agri-Food Canada

107 Science Place
Saskatoon, SK.
S7N 0X2
(306)- 956-7265
email Muira@em.agr.ca

Appendix B: List of EM treated flaxseed lines with SDG levels ± 2 SD

Samples which fall outside the **three SD** range (7.24 – 14.08mg/mL) are noted * with the corresponding amount)

Year 1

Low

EM 24
EM 27
EM 145
EM 186
EM 192
EM 280
EM 347
EM 484
EM 516
EM 557
EM 561
EM 604
EM 666
EM 672
EM 693
EM 709
EM 710
EM 729
EM 736
EM 746
EM 868
EM 919
EM 938
EM 950
EM 991
EM 992
EM 1015
EM 1066
EM 1142
EM 1143
EM 1157
EM 1166
EM 1189
EM 1207* (6.8)
EM 1213
EM 1230
EM 1242
EM 1247
EM 1248
EM 1272
EM 1301
EM 1335* (6.5)
EM 1345
EM 1418
EM 1437
EM 1440
EM 1444* (7.1)
EM 1447
EM 1451

High

EM 241
EM 315
EM 352
EM 505
EM 667

EM 766
EM 803

EM 1129* (14.5)
EM 1175* (14.6)
EM 1190
EM 1228

2nd Year

Low	High
2-E78	2-E99
2-E85	2-E142
2-E146	2-E268
2-E187	2-E301
2-E209	2-E312
2-E258	2-E427
2-E270	2-E439
2-E343	2-E443
2-E426	2-E634
2-E444	2-E708
2-E459	2-E1200
2-E595	2-E1350
2-E616	2-E1362
2-E626	2-E1368
2-E675	2-E1385
2-E1057	2-E1409
2-E1196	2-E1424
2-E1201	2-E1440
2-E1228	2-E1444
2-E1374	
2-E1423	
2-E1508	
2-E1683	
2-E1693	